968,331

PATENT SPECIFICATION

NO DRAWINGS

968,331

Date of Application and filing Complete Specification Jan. 2, 1961.

No. 70/61.

Application made in Norway (No. 134,495) on Jan. 18, 1960.

Complete Specification Published Sept. 2, 1964.

Index at acceptance: —A2 D(2H1, 2L, 3B)

International Classification:—A 23 I

COMPLETE SPECIFICATION

Additive to Meat and Meat Products

I, LEIF NERAAL, of Norwegian nationality of Skippergaten 27, Oslo, Norway, do hereby declare the invention. for which I pray that a patent may be granted to me, and the method by which it is to be performed, to be particularly described in and by the following statement: —

This invention relates to a meat additive. As is known, the colour and colloidal condition of meat depends, among other things, on its pH. There is a close connection between its swelling, water-binding capacity and pH. A lowering of the pH factor effects a shrinkage of the albuminoid substances and thereby a reduction of the water-binding capacity. (The term "meat" as used herein refers not only to substantially unprocessed meat but also to meat products, such for example as sausages).

Ensuring that the water-binding capacity remains effectively constant is important in the production of sausages as well as in that of salted products such for example as ham. In the latter case the swelling action has a binding effect on the meat's body-juice and this has an influence on both its taste and nutritive value. It is generally known that phosphates have a favourable influence on the development of the pH and on the swelling.

A too strong increase of the meat's pH will, however, have an unfortunate effect upon its colouring. Thus, phosphates alone may readily cause grey spots to appear on the meat due to a too strong increase of the pH.

As is known, the addition of nitrite and nitrate is of great importance for the colouring of meat products and more particularly so with respect to salted, smoked or cooked products.

The meat's redox-potential (nitrate-nitrite-NO reduction, oxidation of myoglobin into metamyoglobin) has a determining effect upon its colouring and pH. When the reduction of nitrite to NO is too slow, the myoglobin (the meat's red colouring agent) is oxidized into metamyoglobin (grey colour). This oxidation is accelerated when the meat has a too high pH—i.e. above 6.5. There will also be an accelerated oxidation of myoglobin to metamyoglobin when the meat has a too low pH—i.e. under 5.2.

Phosphates will, as mentioned above, bring about a rise in the pH. It is furthermore known that substances such as ascorbic acid, Na-ascorbate, iso-ascorbic acid and the monosaccaride type sugars, have a reducing effect upon nitrate and nitrite. These substances also have a reducing effect upon the pH. Pyridine derivatives such as nicotinic acid and nicotin-amide as well as hydroxy-carboxylic acids such as tartaric acid and citric acid also have a pH-reducing effect, but these acids have no direct reducing effect upon nitrate and nitrite, only an indirect one through their pH-reducing effect. Nicotinic acid, furthermore, has a colour-stabilizing effect.

According to the present invention there is provided an additive which will stabilise the pH of meat (as hereinbefore defined) and influence the colloidal conditioning and colouring thereof, which comprises ascorbic acid or d - iso - ascorbic acid or a salt thereof, nicotinic acid or a salt thereof or nicotinamide, a hydroxy-carboxylic acid, a reducing saccharide and a mixture of phosphates, especially hydrated phosphates and hexametaphosphates. Usually this additive will comprise 1% to 8% of ascorbic acid or d-iso-ascorbic acid or a salt thereof, 1% to 5% of nicotinic acid or a salt thereof or nicotinamide, 1% to 5% of an hydroxy-carboxylic acid, 10% to 30% of a reducing saccharide and 50% to 80% of phosphates, and will have a pH of 6.5 to 8.5, preferably 7 to 7.5. The additive is normally added to meat in the proportion of 0.1% to 0.5%.

By "stabilize the pH of meat" is meant bringing (if necessary) and keeping the pH of the meat above 5.2 and under 6.5. The

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additive of the invention causes the necessary swelling to take place, while maintaining the water-binding capacity and producing the desired reducing effect (nitrate-nitrite-NO). This pH "stabilisation" is particularly important in salted products such as cooked or raw ham, collared beef and long-keeping sausages such as red salami and black (mutton) sausages. The pH will always be slightly reduced during the curing process. It also is a condition for a favourable curing. It is, however, of great importance that the pH-reduction should not be effected too fast as the nitrate reduction has to be taken into account. The nitrate is to be reduced to nitrite and this reduction occurs most quickly when the pH of the product is above 5.4. The nitrite is then to be reduced to NO. An important factor of the curing process lies in the activity of bacteria and this activity is conditioned by the fermentation of the meat's lactic acid. The bacteriological activity also depends on the pH of the product since it must lie within the limits of 5.2—6.5. An additive according to the present invention maintains the pH within these limits while favouring the fermenting process.

The swelling of the meat proteins is caused by the pH of the phosphate present and ATP (adenosinetriphosphate). An excessive increase of the meat's pH caused by a high pH of the phosphate will easily result in saponification of the fat, especially in smoked sausage, and this gives the sausage an unpleasant soapy flavour. A strong increase of the pH will also, as before mentioned, have a disturbing effect on the colouring, the lactic acid fermentation and the bacteriological activity.

Nor will the swelling thus obtained be of any particular duration and it will eventually be followed by a lowering of the pH, shrinkage and loss of nutritive substance, such as body-juice and albuminoids. It is therefore important to obtain a swelling which is as satisfactory as possible. This is best achieved through a moderate pH of 7 to 8 and an optimal ATP amount, expressed in terms of the phosphate's P_2O_5 content. The relation between the pH and the phosphate's P_2O_5 is also determining for the effect of the other substances in the mixture according to the present invention. As the pH in all these substances remains below 7 and is, in certain cases, considerably below this figure, they would of course counteract the influence of a strongly alkaline phosphate if brought into contact with such a substance. Experiments have however proved that by using a phosphate, especially a hydrated phosphate with pH and P_2O_5 content as hereinbefore described, better results are attained with regard to not only colouring and the product's general appearance, but also with regard to yield and reduction of curing period and production defects, than with products where phosphates alone or the other substances of the composition of the invention with no phosphates present, are used. In addition to this the additive also acts as preserving agent owing to its pH-stabilizing effect.

EXAMPLE 1.

Saveloy was produced from a mixture composed of 11.5 kilos of dressed beef, 8.5 kilos of dressed veal and 15 kilos of bacon, which were mechanically chopped up and mixed together. Salt, spices and nitrite salt were added with water. This mixture was divided in four parts, A, B, C and D, each weighing 12.5 kilos. No further substances were added to part A. To part B, a 0.2% phosphate composition comprising sodium tripolyphosphate and sodium hexametaphosphate was added. To part C, there was added 0.1% of a composition of (89%) glucose, (5%) ascorbic acid, (3%) nicotinic acid and (3%) tartaric acid, whereas to part D there was added 0.3% of a mixture composed of 67% of a phosphate composition as above and 33% of the mixture which was added to C.

After the additives were introduced into the preparations, the mechanical chopper was allowed to operate for a further two to three minutes in order to achieve an even distribution of the additives throughout the various mixtures.

Each of the four portions were stuffed into synthetic casings of calibre 65 mm., prior to being smoked and cooked.

Sausages obtained from parts B and D had, after cooking, the best consistency and showed a smooth and well-filled appearance while the sausages obtained from parts C and D showed the best colouring.

The sausages were then cut in two pieces and stored in a cooler, being here exposed to light and air. After six hours the sausages of part A clearly showed a grey colouring and considerable shrinkage. Sausages of part B were smoother and of better consistency than those of part A, although in this instance too the colouring was grey and unappetizing. Sausages of part C showed the same shrinkage as those of part A, whilst their colour was attractively red, although rather dull. The sausages of part D showed up best with a definitely reduced shrinkage and a well-marked, fresh-looking colouring.

After nine hours the colour of part C appeared to fade away (showing a greyish shade), whilst the colour of part D, after twelve hours of exposure, still looked as fresh as at the beginning, thereafter beginning to show signs of fading.

EXAMPLE 2.

Red salami sausages were produced by mixing 30 kilos of beef to 7 kilos of veal, 5 kilos of pork and 20 kilos of bacon, which were

ground together and mixed. Salt, spices and nitrate salt were added. This mixture was divided into four parts, A, B, C and D, each weighing 12.5 kilos. No further additions were were made to part A. Part B received 0.15% of the phosphate composition used in Example 1. To part C, there was added 0.1% of a mixture composed of (89%) glucose, (5%) of Na-ascorbate, (3%) nicotinic acid and (3%) of tartaric acid, whilst to part D there was added 0.25% of a mixture composed of 60% of the phosphate composition used in Example 1 and 40% of the composition added to C. The additives were then thoroughly mixed throughout the mass.

Each part was then stuffed into synthetic casings of calibre 90 mm., prior to being salted and smoked at a temperature of 15 to 20° C., whereupon they were weighed and hung up for drying and curing. The ordinary curing period for salami sausages is from four to six weeks.

After four weeks, sausages obtained from all four parts were cut in two. The sausage from part A was still uncured, its consistency was poor and the colouring a dull red. The sausage of part B showed a considerably better consistency and the curing process was clearly more advanced. The sausage of part C showed a more attractive colouring than A and B, whilst its curing and consistency were about equal to those of part A. The sausage of part D showed a very nice red colour and an excellent consistency whilst its curing was practically finished and the sausage was ready to be consumed right away.

After a further two weeks, the condition of all the sausages was checked again. Curing was then complete for all. However, a number of the sausages filled with part A mixture, showed defects in that the dark outer rim which is so much feared in professional spheres was present. This also affected the colouring, which was not very good. The consistency of all sausages of part A was poorer than that of the other sausages. Sausages from part B had a good consistency but here too a few sausages showed signs of a darkening outer rim. The colour was about the same as that of part A, possibly somewhat better. Sausages of part C had a poorer consistency than those of part B and a greater number of dark outer rims, but the colouring was better than both those of A and B, being an attractive red which was, however, somewhat marred on those showing signs of darkening. The sausages from part D had a very good consistency, without any trace of darkening rims and the colour was better even than in those of part C, as none were blemished by signs of darkening.

All sausages were now weighed again and they showed the following mean loss in weight during the curing process (drying): A—25.6%, B—23.8%, C—25.5%, D—23.3%.

EXAMPLE 3.

Four hams, A, B, C and D, were unboned. Ham A was given an intra-muscular shot of a 20° Bé nitrite salt brine and was then soaked in this brine for three days. Ham B was given a shot of 20° Bé nitrite salt brine in which of the phosphate composition of Example 1 3% had been dissolved, and then soaked in this brine for three days. Ham C was given a shot of 20° Bé nitrite salt brine in which was dissolved a 1% mixture composed of (88%) glucose, (6%) Na-ascorbate, (3%) nicotinic acid and (3%) tartaric acid, and then soaked in this brine for three days. Ham D was given a shot of 20° Bé nitrite salt brine in which was dissolved a 3.5% mixture composed of 80% of the phosphate composition used in Example 1 and 20% of the same mixture used with ham C, and then soaked for three days in the same brine. All four hams were then cooked, packed in polyethylene film and then kept cold.

After fourteen days of storage, the hams were unpacked and cut through. Ham A showed a dull colour and a slimy layer on the outside, whereas ham B showed signs of a reddish colouring and had a dry outer surface. Ham C had a good colouring but had a slimy outside layer. Ham D had a better colouring than ham C and its outer surface was dry.

After a further fourteen days of storage in a dark cooler, this time in unpacked condition, a new check-up was made. The colour of ham A was now much worse and had become grey. Its surface was all slimy. Ham B also was grey now, whilst its surface was still dry and free of any slime. Ham C showed a rather dulled red colouring and its surface was, like that of ham A, all covered with slime. Ham D showed no sign of dullness in its colouring but had acquired a somewhat darker hue of red. Its surface was dry and free of slime.

EXAMPLE 4

1,000 grams of ground beef were divided in four parts, A, B, C and D. Part A received no additive. Part B was given an addition of 0.1% of the phosphate composition used in Example I. To part C was added 0.1% of a mixture composed of (89%) glucose, (5%) ascorbic acid, (3%) nicotinic acid and (3%) tartaric acid, while D received an addition of 0.2% of a mixture composed of 50% of the phosphate composition used in Example 1 and 50% of the composition which was added to C.

When these substances had been well and evenly mixed with the ground beef, the four portions were stored in a cooler at a temperature of +6° C. After six hours the colour of the meat of parts A and B was grey. The colour of C was a somewhat dull

red and lasted for twelve hours while the colour of D was a fresh-looking red and lasted for eighteen hours.

Specification No. 802,126 describes and claims a preparation for preserving the colour of meat and meat products comprising a β-substituted pyridine derivative, ascorbic acid and a reducing sugar. It does not describe the use of salts of phosphoric acids.

I am aware of the Preservatives in Food Regulations, 1962, and in so far as my invention relates to the manufacture for sale in the United Kingdom and/or sale in the United Kingdom of foodstuffs preserved by the process herein described, I make no claim to use the process in contravention of the law.

WHAT I CLAIM IS:—

1. An additive which will stabilise the pH of meat (as hereinbefore defined) and influence the colloidal conditioning and colouring thereof, which comprises ascorbic acid or d-iso-ascorbic acid or a salt thereof, nicotinic acid or a salt thereof or nicotinamide, a hydroxy-carboxylic acid, a reducing saccharide and a mixture of phosphates

2. An additive according to claim 1 which comprises 1% to 8% of ascorbic acid or d-iso-ascorbic acid or a salt thereof, 1% to 5% of nicotinic acid or a salt thereof or nicotinamide, 1% to 5% of an hydroxy-carboxylic acid, 10% to 30% of a reducing saccharide and 50% to 80% of phosphates.

3. An additive according to claim 1 or 2 wherein the phosphates are hydrated.

4. An additive according to any one of the preceding claims wherein the mixture of phosphates comprises at least one hexametaphosphate.

5. An additive according to any one of the preceding claims which has a pH of 6.5 to 8.5.

6. An additive according to any of the preceding claims which has a pH of 7 to 7.5.

7. An additive according to any one of the preceding claims wherein the salt of ascorbic acid is sodium ascorbate, the hydroxy-carboxylic acid is tartaric acid or citric acid, the reducing saccharide is glucose and the mixture of phosphates comprises sodium tripolyphosphate and sodium hexametaphosphate.

8. An additive according to claim 1 substantially as described.

9. Meat (as hereinbefore defined) containing additive claimed in any one of claims 1 to 8.

10. Meat according to claim 9 wherein the amount of additive is 0.1% to 0.5%.

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Leamington Spa: Printed for Her Majesty's Stationery Office by the Courier Press.—1964.
Published at The Patent Office, 25, Southampton Buildings, London, W.C.2, from which copies may be obtained